

Remarks

Thorough examination by the Examiner is noted and appreciated.

The claims have been amended to more clearly claim Applicants invention.

Support for the amended and newly drafted claims are found in the original claims and/or Specification.

For example new limitations in claims 1 and 12 are found in the Specification at paragraph 0035:

"Accordingly, the present invention, through the use of the representative device doping profile, enables analysis and **evaluation of a doping profile in an individual device structures** forming the monitor device."

and at paragraph 0027:

"By example only, an exemplary application of the present invention is explained in detail by reference to exemplary semiconductor structures, it being understood that the present invention is applicable to a wide variety of semiconductor structures **whereby a two dimensional doping profile may be advantageously obtained using SIMS according to the present invention.**"

Support for amended in claims 2 and 13 is found, for example, in the Specification at paragraph 0036.

"Figure 4, for example, shows a top view of a portion of a monitor pattern 40 formed on a target surface showing a cross section of repeating LDD NMOS semiconductor devices structures after stripping overlying layers back to reveal the start of a doping profile at the polysilicon. The monitor pattern is regularly repeated, as in, for example a crystalline structure, in three dimensions, **although only two dimensions are revealed at the target surface (in plane of drawing).**"

The remaining amendments and newly drafted claims find support in the original claims and/or the Specification. No new matter has been entered.

Claim Rejections under 35 USC 102(b)

Claims 1-2, 4-16, and 18-20 are rejected under 35 USC 102(b) as being anticipated by Lee et al. (US Pat No. 6,172,399).

Lee et al. disclose a microwave method for annealing ion implanted wafers to achieve a desired doping profile (see Abstract).

In an experimental section Lee et al. disclose using a preamorphized silicon wafer bombarded with high energy Germanium

ions and doped with boron followed by microwave heating (see e.g. col 6, lines 15-20). The dopant profile through the thickness of the wafer is determined by a conventional SIMS method prior to and after microwave annealing (see col 7, lines 3-7). Lee et al. disclose a series of SIMS plots for different regions of microwave exposure (See FI 8, col 7, lines 33-41). Nowhere do Lee et al. disclose determining 2-dimensional doping profiles of individual semiconductor structures as disclosed and claimed by Applicants.

Lee et al. is largely irrelevant to Applicants disclosed and claimed invention other than disclosing a SIMS measurement through a thickness of a doped semiconductor wafer which is not disclosed to include any semiconductor structures.

In contrast Applicants amended claim 1 claims:

"A method of forming a SIMS monitor device for determining a 2-dimensional doping profile of a semiconductor device structure comprising the steps of:

providing a plurality of regularly repeating semiconductor structures including a doping profile to form a monitor device including at least one layer of the regularly repeating semiconductor structures;

planarizing the monitor device through a thickness of the regularly

repeating semiconductor structures to reveal a target surface overlying the doping profile to form a monitor pattern;

sputtering the target surface over a sputtering area including the monitor pattern through a thickness thereof while simultaneously detecting and counting over a time interval at least one type of species ejected from the target surface according to a secondary ion mass spectroscopy procedure (SIMS) and,

determining a 2-dimensional doping profile for an individual semiconductor structure."

Contrary to Examiners assertions, Applicants respectfully assert that Lee et al. do not disclose anything relevant to Applicants claimed invention other than making a SIMS measurement on a doped semiconductor wafer without semiconductor structures. Examiner argues that Applicants claimed invention is disclosed by repeated reference to a conventional NMOS and PMOS device pair (see Fig. 1C) shown by Lee et al. Applicants point out the Figures 1A through Figures 1C are related to a discussion in the background of the invention which generally discusses the importance of doping profiles for CMOS devices and the problem of diffusion of dopants by conventional annealing methods. Lee et al. nowhere disclose that making a SIMS measurement to determine the doping profiles of individual semiconductor structures but rather disclose a doped semiconductor wafer (without semiconductor structures) subjected to a SIMS measurement in an

experimental method to determine the effect of microwave heating on dopant diffusion in the wafer. Lee et al. is clearly insufficient to anticipate Applicants disclosed and claimed invention.

Claim Rejections under 35 USC 103(a)

Claims 3 and 17 stand rejected under 35 USC 103(a) as being unpatentable over Lee et al. (US Pat No. 6,172,399) as applied above.

Applicants reiterate the comments made above with respect to Lee et al.

With respect to claim 3, Examiner argues that "the process of planarizing a layer using a chemical mechanical polishing (CMP) is well known to a person having ordinary skill in the art."

Applicants respectfully point out that whether an individual step in Applicants invention is well known in the art is irrelevant to the issue of patentability.

"The fact that references relied upon teach that all aspects of the claimed invention were individually known in the art is

not sufficient to establish a prima facie case of obviousness without some objective reason to combine the teachings of the references." *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993).

In any event, as previously explained Lee et al. does not disclose Applicants invention nor is there any suggestion or teaching of a planarization process in Lee et al. or a regularly repeating pattern of semiconductor structures or the step of determining a doping profile for an individual semiconductor structure.

With respect to claim 17, Examiner argues that "there is no evidence indicating the length of the rectangular shape is critical and it has been held that it is not inventive to discover the optimum or workable range of a result-effect variable with given prior art conditions by routine experimentation".

The above argument, by its own terms, and as is well recognized by the case law including *In re Woodruff* 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936, (Fed Cir 1990), presupposes that the general conditions (or elements) of Applicants claimed

invention is present in the prior art and that patentability depends on the ranges of the result effective variable.

Applicants respectfully assert that Lee et al. falls far short of producing Applicants claimed invention with respect to both claims 1 and 12 and therefore is of no help to Examiner in establishing a *prima facie* case of obviousness.

"First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. **Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.** The teaching or suggestion to make the claimed combination and the reasonable expectation of success **must both be found in the prior art, and not based on applicant's disclosure.**" *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)) Emphasis added.

The Claims have been amended to clarify Applicants claimed invention. A favorable consideration of Applicants' claims is respectfully requested.


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Based on the foregoing, Applicants respectfully submit that the Claims are now in condition for allowance. Such favorable action by the Examiner at an early date is respectfully solicited.

In the event that the present invention as claimed is not in a condition for allowance for any other reasons, the Examiner is respectfully invited to call the Applicants' representative at his Bloomfield Hills, Michigan office at (248) 540-4040 such that necessary action may be taken to place the application in a condition for allowance.

Respectfully submitted,

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